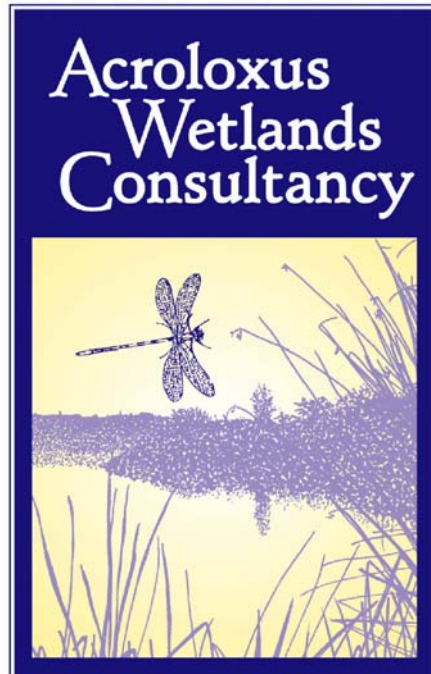


Framework for Texada Stickleback Action Plan

July 2005



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Table of Contents

1. Introduction	1
2. Goals	1
3. Specific Aims	2
3.1. Stewardship.....	2
3.2. Education and Communication.....	2
3.3. Conservation	2
3.4. Monitoring and Research	3
4. Actions	3
4.1. Stewardship.....	3
4.2. Education and Communications.....	4
4.3. Conservation	4
4.3.1. Exotic Species	4
4.3.2. Water Use and Water Quality	5
4.3.3. Recreation	6
4.3.4. Forestry.....	7
4.3.5. Other Land Uses.....	7
4.3.6. Government Policy	8
4.4. Monitoring and Research	8

1. Introduction

Stickleback species pairs (*Gasterosteus* spp.) contribute uniquely to provincial and global biodiversity, and are also of great importance to science because their unique genetic history, extremely limited distribution, and fascinating ecology provide invaluable insight into the processes leading to the evolution of new species. Sticklebacks are now seen as one of the key models for studying the recent evolution of vertebrate species.

The primary objective of the Texada Stickleback Group (TSG) is to oversee development and implementation of an effective Texada Stickleback Action Plan (TSAP) that will ensure the continued long-term persistence of stickleback species pairs through careful stewardship of the four lakes where sticklebacks occur on the Island. A program of conservation, education, communication, monitoring and research, founded on community engagement, is required to achieve these goals on a sustainable basis.

The purpose of this document is to serve as a framework for the TSG in their discussions to develop a comprehensive Action Plan.

2. Goals

The overriding goal of the Texada Stickleback Group (TSG) is to ensure the persistence of all stickleback species pairs on Texada Island.

In the Short-term the goal of the TSG will be:

To establish a group of community stakeholders to devise the Texada Stickleback Action Plan (TSAP) and initiate actions to ensure the persistence and protection of stickleback species pairs on Texada Island

In the Long-term the goal of the TSAP will be:

To ensure the maintenance of self-sustaining populations of stickleback species pairs in Paxton, Balkwill (Spectacle), Priest, and Emily (Turtle) Lakes, and prevent their extinction or collapse into one hybridized population

3. Specific Aims

The Texada Stickleback Action Plan is expected to include the following specific aims:

3.1. Stewardship

- a) To foster awareness of stickleback species pairs and their unique conservation status through hands-on involvement of community stakeholders and all other interested parties
- b) To foster and initiate stewardship activities by appropriate stakeholder groups, and to set up the TSG to administer and co-ordinate stewardship activities

3.2. Education and Communication

- a) To provide the necessary forums to empower Texada residents of all ages, to heighten awareness of residents as to the irreplaceable value and uniqueness of the species pairs, and to spread the word on stickleback species pair protection
- b) To provide information on status, scientific importance, fragility of ecosystem of lake systems, and the deleterious effects of the introduction of exotic species
- c) To advise on interpretation, such as signage, and to assist with media coverage

3.3. Conservation

- a) To maintain and where possible enhance the ecological integrity and stability of the ecosystems in the four lakes which hold stickleback species pairs and, in particular, to preserve the critical habitat features that permit their survival
- b) To facilitate policies and actions that minimize the introduction of exotic species that may lead to species extinction
- c) To ensure that government policy supports conservation initiatives

3.4. Monitoring and Research

To involve and instruct stewardship groups in the appropriate monitoring of stickleback populations, water quality, and habitat status to the extent feasible with the means available to them, and to establish a regular monitoring framework to track status and trends

To increase scientific understanding of stickleback species pairs and specifically identify the threats to their survival and the underlying mechanisms involved, in particular those that occur due to activities that could lead to hybridization and species collapse

4. Actions

To implement initiatives that fulfill the specific aims set out above, Texada Stickleback Action Plan is expected to include some or all of the following actions.

4.1. Stewardship

Because much of the land around lakes is privately owned, stewardship will play a pivotal role in ensuring survival of species pairs. The TSG will help to explore and encourage landowner stewardship.

Stewardship initiatives might include:

- a) Inviting stakeholders and interested parties such as watershed residents, business groups, social groups, First Nations, youth and school groups to partner with TSG in workshops, community events, and active stewardship activities such as monitoring
- b) Encouraging the involvement of local residents, particularly in providing a safe environment for stickleback species pairs
- c) Establishing a protocol for approaching landowners about the possibilities of land-use agreements, such as conservation covenants.
- d) Identifying specific stewardship actions that will benefit stickleback species pairs (i.e., involving high school students in annual monitoring, measuring water levels, turbidity, etc.)
- e) Helping to obtain funding to support stewardship activities

4.2. Education and Communications

The discovery of stickleback species pairs and their subsequent importance to evolutionary research is one of the most exciting genetic stories of recent times. Most of the unfortunate negative impacts on species pairs have occurred due to a lack of public awareness about their significance. It is important, therefore, to raise public awareness and appreciation of species pairs and to communicate the threats to their survival.

Education and communications initiatives might include:

- a) Working with teachers to develop educational material for use in local schools on Texada Island and in Powell River
- b) Setting up educational workshops and open houses for groups of all ages, to include First Nations, local government, local businesses, landowners, youth groups, recreational organizations, and all other interested parties
- c) Working with government agencies to develop new educational materials to explain potential ecological impacts of exotic species.
- d) Inviting experts from the Recovery Team to present the latest results of their research
- e) Encouraging media communications in local newspapers, on television and radio, and through tourist publications
- f) Producing brochures, posters and display boards for community events

4.3. Conservation

To maintain the current status of all populations of sticklebacks in all four lakes on Texada and ensure their continued protection, conservation actions should include:

4.3.1. Exotic Species

Introductions of exotic species, such as brown bullhead (*Ameiurus nebulosus*) and crayfish (*Pacifastacus leniusculus*), may be the greatest threat to stickleback species pair survival. Immediate responses may be required to eliminate such threats. Stickleback species pairs live only in lakes containing one other fish species, cutthroat trout (*Oncorhynchus clarki*). Any additions to this simple fish community could prove harmful. For example, the stickleback species pair once found in Hadley Lake on Lasqueti Island, is now extinct because of nest predation by the

introduced brown bullhead (*Ameiurus nebulosus*). Similarly, the species pair in Enos Lake on Vancouver Island has collapsed to one hybridized population probably due to the accidental introduction of crayfish.

Exotic species action initiatives might include:

- a) Developing a comprehensive Exotic Species Management Plan for Texada Island
- b) Working with government agencies to develop an emergency response plan for immediate implementation in the case of an exotic species introduction into Paxton, Balkwill, Priest, or Emily Lake
- c) Developing signage at ferry terminals and educational workshop for ferry workers

4.3.2. Water Use and Water Quality

Concerns with development activities relate to water quality and water levels, both of which can alter lake ecology to the detriment of stickleback species pairs. Water volume (and therefore lake level) is regulated by water licenses for diversion and storage. Existing licenses are large relative to the size of some of the species pairs' lakes.

Water extractions have caused drawdowns of Paxton Lake in the past. Such diversions have ceased, but the water licenses have been maintained (via payment of water licensing fees), so the threat of future water extractions remains.

Depending on duration, frequency, magnitude, and rate of change, drawdowns could have considerable impacts on littoral productivity and pelagic volume. Changes in water level would likely have a direct effect on stickleback species pairs, impacting both spawning and feeding habitats.

Water quality can be influenced by a number of water-use and land-use practices. For example, the construction of small dams has raised water levels to some extent on all the species pairs lakes. Elevated water levels flood vegetation and soils, and can cause considerable inputs of nutrients. Raised sediment levels can also affect turbidity in lakes, which in turn can result in species pairs' hybridization. Eutrophication and pollution can come from a variety of human activities and are specific concerns that can be managed by limiting inputs.

More information is required in the following areas:

- a) Lake bathymetry, surface area and volume
- b) Potential for nutrient inputs from explosives used in mining activities
- c) Inflows and outflows of the lakes
- d) Lakeshores and surrounding environments
- e) Water abstraction volumes

Liaison is also required to:

- a) Examine alternative water management techniques with license holders
- b) Explore alternative water management techniques to increase water use efficiency
- c) Develop criteria and/or an assessment model for determining the effects of water drawdowns
- d) Ensure license holders are exercising due diligence by making beneficial use of the water allocated as required in Section 23 (2) (b) of the Water Act
- e) Explore the possibility of obtaining conservation licenses on some of the lakes for unallocated water under Section 7 (d) of the Water Act

Ideally, development of a Water Use Plan for the lakes is required.

4.3.3. Recreation

Anglers fish in the Vananda Creek watershed but seldom use the Paxton watershed. The primary threats from recreational angling occur due to competition, predation, and disease transfer resulting from illegal transplants of fish (exotic or native species); the illegal use of exotic species as bait (fish and aquatic invertebrates); and hatchery introductions that do not conform to present provincial policies.

Remedial measures to address these issues might include:

- a) Working with provincial agencies to enact, communicate, and enforce a ban on stocking of any species on all lakes with species pairs, through support of existing provincial regulation and policies. (The unauthorized transport and transplant of live fish or live aquatic invertebrates is illegal in the province of B.C. Provincial policy prevents agency stocking of fish into waters containing wild fish stocks or listed fish species.)
- b) Working with provincial agencies and stewardship groups to prevent the establishment of fisheries on lakes that are not currently used for fishing.

- c) Working with provincial agencies to enforce a bait ban
- d) Providing educational signage with visuals, describing the impacts of introduced species, to be posted at fishing accesses along lakeshores

4.3.4. Forestry

The major causes of concern from the activities of the forestry industry are eutrophication, increased turbidity, and habitat alteration. Input of nutrients and suspended sediments can lead to increased turbidity in the water. The latter may have been a factor in the loss of species pairs in Enos Lake on Vancouver Island. Riparian and littoral habitat may be affected by increased soil erosion caused by road building, forest harvest and clearing for building sites.

Initiatives to address these forestry-related issues could include:

- a) Reviewing relevant literature in liaison with the RAG and other stakeholders to develop science-based criteria and/or an assessment model for determining effect of harvest within species pairs watersheds
- b) Consulting with provincial agencies to develop forest harvest protocols based on the agreed criteria
- c) Creating nutrient budgets for Paxton, Balkwill, Emily and Priest Lakes

4.3.5. Other Land Uses

Impacts from other land-based development activities in watersheds inhabited by species pairs include mining, road building, pipeline construction and housing developments. Eutrophication, sedimentation, and nearshore habitat destruction or alteration may result from such operations.

Areas of further study should include:

- a) Reviewing relevant literature and working with appropriate levels of government to develop criteria for assessing effects of land use on stickleback species, to establish Best Management Practices for land use within species pairs watersheds, and to designate species pairs watersheds as Special Development Areas.

4.3.6. Government Policy

Specific policy-level initiatives may be required to minimize risk to stickleback species pairs.

Such policy initiatives might include:

- a) Working with appropriate levels of government to develop, communicate, and implement Best Management Practices for land development
- b) Seeking participation by local and provincial government agencies
- c) Communicating Recovery Strategy and Stickleback Action Plan to appropriate governmental organizations

4.4. Monitoring and Research

Managing threats to stickleback species pairs requires monitoring to ensure that appropriate measures can be put in place if risks to the species pairs show signs of increasing. The TSG and the Research Action Group (RAG) should liaise in the development of a monitoring program to be delivered by local stewardship groups to whatever extent is practical. Anecdotal evidence is also vital and Texada residents should be encouraged to be on the look out for and to report sightings of exotic species, inappropriate land or water use, or pollution incidents.

A Texada Stickleback monitoring program might include:

- a) Installation of permanent water-level gauges in species pairs lakes
- b) Monitoring of water quality and lake productivity
- c) Monitoring of fish populations
- d) Mapping of littoral vegetation
- e) Studies of seasonal migration and dispersal patterns of species pairs

Research projects should be undertaken with the help and advice of the Recovery Team